

New Developments in Plant Conservation and the Relevance of Ethnobotany

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Abstract: There is only one cover of plants on Earth, so all plant-related aspects of conservation should be considered in deciding how the land and the plants on it should be managed for conservation purposes. A three-fold classification of the benefits to be derived from ecosystem-based plant conservation (EBPC) is suggested: conservation of plant species, the sustainable use of plant resources and the delivery of ecosystem services. EBPC is a place-centred approach which, in principle, can be pursued anywhere. Ethnobotanical research can help reveal realities about relationships between local people and plants, thus providing information useful for advancing plant conservation. Applied ethnobotany involves ethnobotanists working in a participatory way with local people, both parties contributing to the identification and resolution of conservation issues relating to plants. This type of research helps ensure that priority issues from the local perspective are addressed, thus making it more likely that local people will be committed to implementing solutions found. Both knowledge and values associated with local communities, and knowledge and methodologies associated with science are brought together in the conservation cause.

Key words: Biocultural diversity; Ecosystem-based; Ecosystem services; Evidence-based; Participatory

CLC number: Q 948.12

Document Code: A

Article ID: 2095-0845(2013)04-424-07

1 Plant conservation at a time of environmental crisis

The global ecosystem is deeply perturbed, as shown by climate change, ocean acidification and other indicators. Major changes are predicted for the near future, with the movement of biotic and agricultural zones, coastal flooding threatening cities and mass movements of people (Karling, 2001). These developments are additional to major stresses already imposed on natural systems by the demands on resources and pollution produced by a huge and growing number of people.

The state of the plant world reflects the precarious state of the global environment as a whole. It is estimated that 22 per cent of plant species are at risk of extinction (RBG, 2010), the genetic diversity of both cultivated and wild plants is declining, much agriculture is unsustainable (judging by widespread soil erosion and eutrophication of water bodies),

rangelands are commonly over-grazed and desertification spreading, and many people suffer from shortages of essential plant resources, such as fuelwood (He, 2009; RBG, 2010; Schemske *et al.*, 1994; Schroter *et al.*, 2005).

This is an emergency. Therefore, people interested in particular facets of the environment should organise their efforts to ensure that their contributions to conservation are most effective. Plants form one such facet. For greatest effectiveness, plant conservation should embrace all plant-related aspects of conservation, given that there is only one cover of plants on the land and that contributions made to different aspects of plant conservation can be synergistic.

A very large number of organisations is concerned with the management or use of plants, for instance those connected with agriculture, forestry, pastoralism and horticulture. Many of these organisations already contribute to plant conservation, but

coordination between them to achieve maximum conservation effectiveness is a challenge, resulting in weaknesses in influencing policy. Two quotes from reviews of progress on the Global Strategy for Plant Conservation (GSPC), an international agreement on plant conservation made in 2002, illustrate this problem of institutional complexity: “A further challenge (in strengthening the scientific contribution to plant conservation) is the need to integrate better the plant diversity-related activities of what are currently diverse and disconnected sectors, including agriculture, forestry, protected area management and botanic gardens” (Blackmore *et al.*, 2011); “Crucial areas of influence for the plant conservation community in Europe are agricultural and forestry policy. Currently, the former is being influenced for the benefit of conservation by BirdLife International ... and Butterfly Conservation These organisations provide policy-relevant data and analyses that will be influential in the revision of the Common Agricultural Policy in 2012. ... A presence from the botanical and plant conservation community at European level is currently lacking ... ” (Radford, 2011).

To date, ‘plant conservation’ as an established discipline within the global conservation movement has concentrated mainly on conservation of plant species. The approach has been based on linear logical thinking, involving the following principal steps: the listing of plant species for a country or other area of concern, the identification of those that are endangered (Red Lists), the identification of the places where these are found or where plant species generally are concentrated, and then the application of *in situ* and *ex situ* measures to conserve them (Fig. 1). The protected area is seen as the prime *in situ* conservation tool, while *ex situ* facilities include botanic gardens and seedbanks. This approach has proved relatively successful in the case of *ex situ* conservation, because the appropriate institutions (such as botanical gardens and seedbanks) are relatively easy to identify and bring together for coordinated action. In contrast, despite

some successes, there has been little progress overall with *in situ* conservation, as reported in several papers reviewing progress on the GSPC and exemplified by the statement “we have found no evidence of the targets mobilizing significant new resources for plant conservation” (Paton and Lughadha, 2011).

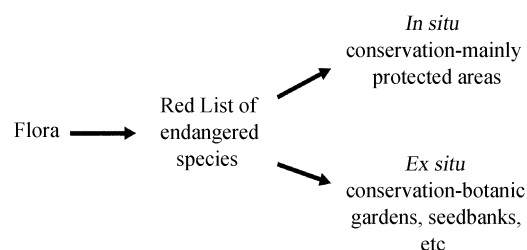


Fig. 1 The linear logical approach of ‘traditional plant conservation’. The problem addressed is how to secure conservation of plant species

While *ex situ* plant conservation does help to preserve plant species, it should not be seen as an alternative to making greater efforts at *in situ* conservation, especially from an ecosystem perspective. The immediate challenge in plant conservation is for the plant conservation community to contribute as much as it can to keep (*in situ*) ecosystems functioning as well as possible.

Compared to other taxonomic groups, plants require distinctive approaches to their conservation because of their keystone roles in ecosystems and economies. Sustainable use and the delivery of ecosystem services should be fundamental parts of plant conservation. The importance of paying attention to sustainable use of plant resources for the conservation of species (in any taxonomic category) is apparent from the major roles that plant-related activities often play in projects aimed primarily at the conservation of birds or mammals. Typically, such projects devote considerable energy to working on plant issues, not only because plants supply the food and physical habitats required by the animals, but also because the major challenges in maintaining the habitats often relate to the unsustainable use of plant resources by local people.

People living close to the sites of charismatic animals or endemic birds tend to have much greater day-to-day involvement with plants than with the animals that are of interest to the conservationists. Rural economies in places where biodiversity is concentrated tend to revolve centrally around plants. However, in urban places distant from field sites, the public tends to have much more interest in birds and charismatic animals (such as tigers, gorillas and pandas) than plants. The membership of the Royal Society for Protection of Birds (RSPB) in the UK is about 100 times larger than that of the equivalent botanical society, Plantlife International. Because animal and bird projects can be relatively well funded and must of necessity deal with botanical issues, the result is that, in some parts of the world, it is likely that animal conservationists are achieving more for conservation of plant species than plant conservationists are achieving themselves.

2 Conservation benefits related to plants

Plant conservation as a discipline will be driven forward by people who combine a concern for the environment with a particular interest in plants and who are activists in the conservation cause. Considering the range of interests of members of this ‘plant conservation community’ a three-fold classification of the benefits to be derived from plant conservation is proposed: conservation of plant species, sustainable use and the delivery of ecosystem services.

For the greater part, conservation of plant species will have to be pursued within the context of use. Finding ways to integrate the conservation of plant species into productive landscapes is one of the major challenges facing plant conservation today (Ashley *et al.*, 2006; Hannah and Hansen, 2005; Manning *et al.*, 2009). Protected areas, the main tool of ‘traditional’ plant conservation, are certainly helpful for conserving plant species, but they will not be adequate on their own to protect the entire world flora. Many species are not found in protected areas, populations of species within protected areas

can be small and of doubtful long-term viability, the management of some protected areas is weak and unable to prevent illegal activities (Nagendra, 2008), and climate change will cause disruption to the ecosystems of many protected areas, causing extinctions of plant species within them.

Ecosystem services (in the sense used here) refer to those benefits that people derive from ecosystems that are not in themselves directly botanical, but whose availability is nevertheless significantly influenced by the type of plant cover on the land. These benefits include climatic amelioration (on global to local scales), provision of water supplies, prevention of flooding, control of soil erosion and landslides, provision of habitats for animals and supply of pollination services. More attention should be paid to such services by the plant conservation community, which will often require collaboration with other social players to make significant advances (McNeely, 2011). Saving plant species is only of limited interest to many members of the public. In contrast, shortages of water or high frequencies of flooding or landslides can stimulate people to take action (Cooke, 2010; Stringer *et al.*, 2007; Yin and Li, 2001). In doing so, plant species can gain opportunistically.

Some of the services received from ecosystems are cultural. It is human nature for people to wish to retain certain natural features of their neighbourhoods, to which they have become accustomed and which have come to be part of their psychological identities. It is common around the world for communities to attach particular significance to certain species of plants or types of vegetation, or particular individual plants or patches of habitat, with efforts made to secure their continuing existence. Where communities have long been resident and livelihoods closely dependent on local plants (as has normally been the case in human history), then a very large number of plant species can come to be valued for a wide range of uses. In the process people have often developed systems of beliefs and practices (often re-

lated to religion) that have tended to preserve these resources (Pei, 2010). Where elements of traditional biocultural diversity remain, then these provide invaluable foundations upon which to build conservation initiatives to tackle the challenges of modern times.

3 A place-centred approach

It is suggested that a place-centred approach is suitable for ecosystem-based plant conservation. Figure 2 illustrates some features of the approach. Earlier versions of the model have been published (Hamilton, 2012; Hamilton and Hamilton, 2006; Pei and Huai, 2009).

Ecosystems, as they relate to plant conservation, are very complex, having multiple dimensions (ecological, cultural, social, economic and political). By focusing on a particular place, the effects of all these influences necessarily come together, as revealed by the type of plant cover present and the ways in which people interact with it. ‘Place’ in this context can mean any area relevant to the practical management of plants. Places can be nested, for example conservation attention may be directed at one part of a farmer’s field, a whole field or a whole farm (with all its fields and other landscape features).

The entire landscape of the Earth can be considered conceptually to be composed of individual local places, at any of which plant conservation can be pursued. An ideal pattern of plants in the landscape can be envisaged, balancing the delivery of all plant-related conservation benefits, one against the other, while also making provision for the use of some land for purposes that contribute little or nothing to conservation (as with built-up areas and much industrial agriculture). The value of such a vision, even if very schematically formed, is that it can provide a common platform to unite the efforts of many people who can contribute to advancing plant conservation locally, each contributing their own special knowledge and skills.

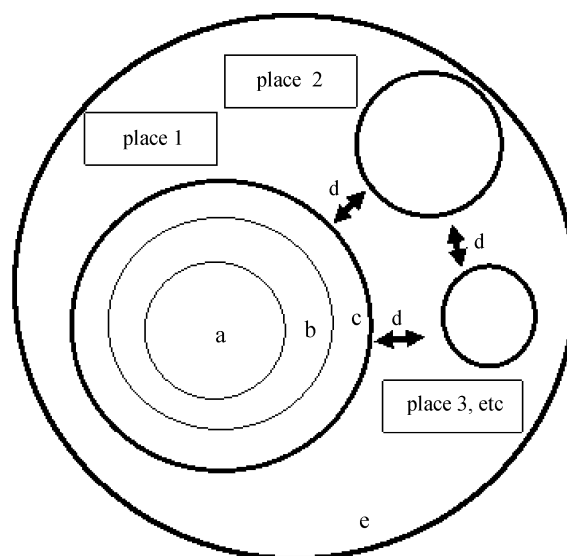


Fig. 2 Representation of Ecosystem-based Plant Conservation
(adapted from Hamilton, 2012)

a. The inner circle represents the plants of any place. These plants may contribute to one or more of the three purposes of plant conservation (species conservation, ecosystem services, sustainable use). Alternatively, the plants may deliver few or no conservation benefits (e. g. as with much intensive agriculture) or be replaced by a plant-free surface (e. g. where the land is covered by buildings); b. The inner ring represents those people who do (or could) influence the plants directly, such as farmers, gardeners, collectors of wild plant resources, and reserve managers; c. The outer ring represents those people who do (or could) influence the plants, though only indirectly, such as lawmakers, consumers, contributors to climate change and conservation biologists; d. Places vary in their relative (actual or potential) contributions to plant conservation. Therefore, the optimal delivery of conservation benefits from plants entails trade-offs between places (indicated by the two-way arrows); e. The outer circle represents the Earth’s limit of ecological sustainability, setting a minimum long-term requirement for conservation achievement. The current level of exploitation of Earth’s ecosystems already exceed the limits of global sustainability (Hails *et al.*, 2008)

For the purpose of analysis and practical action, people can be considered to be divided into two groups in relation to pursuing plant conservation at a particular place—those who can directly influence the plants as they live and those who can also influence the plants, but only indirectly. Typical members of the first group are farmers, forestry workers, pastoralists, gardeners and protected area workers. The other group includes people working in

plant-related industries, the consumers who buy their products, government agencies, religious organisations, educational establishments, training institutes, natural history societies, scientific organisations, among others.

Ecosystems are complex and the effects of interventions for conservation can be difficult to predict (Lester *et al.*, 2010). It is suggested that an evidence-based approach is appropriate for plant conservation. There is a parallel with medicine, also dealing with complex systems and with real results required, and in which an evidence-based approach has proved extremely effective at driving forward improvements in recent years (Sutherland *et al.*, 2004). An evidence-based approach involves periodic reviews of the evidence relating to the success or failure of practical efforts to deal with particular issues, followed by the formulation of recommendations on best practice. These recommendations can then be disseminated for wider adoption, used to reform policy or treated as hypotheses for further testing. If applied properly, an evidence-based approach should not lead to ‘cookbook’ solutions, but rather to the integration of the experience of individual practitioners with the best external evidence (Sackett *et al.*, 1996).

Retaining elements of the natural geographical patterns shown by plant species is an important consideration in plant conservation. To do so will require the presence of a matching cultural diversity, necessary for ensuring the existence of people at every place interested in its unique botanical features and prepared to make efforts to secure their survival.

An example of an evidence-based approach to plant conservation is a programme of Plantlife International, the aim of which was to find answers to the question ‘How can communities best conserve their medicinal plants?’ (Hamilton, 2008, 2011; Pei *et al.*, 2010). This work involved Plantlife International forming partnerships with ten botanical institutes or NGOs in six countries in East Africa and the Himalayas, each of which, in turn, worked with local com-

munities to try and produce practical conservation results. Analysis of the success of these projects, combined with lessons learnt during four events to share experiences, led to the construction of a best practice model. As might be anticipated from an ecosystem-based approach, the model is socially-orientated. Three social elements were identified (community groups, project teams and policy makers) and suggestions made for the forms of relationships between them and actions by each group.

4 The value of ethnobotany for plant conservation

Ethnobotany is the science dealing with the relationships between people and plants. Ethnobotanical research can perform an invaluable role in plant conservation, through providing understandings of how people relate to local plants and how wider cultural, social, economic and political systems influence local people/plant relationships.

Crudely classified, ethnobotany can be pursued in either an academic or applied way. In the former, the ethnobotanist takes the role of outside observer, documenting people’s knowledge, values, uses and methods of management of plants. ‘Academic’ ethnobotany can contribute a lot of information useful for the practical pursuit of conservation, such as about the types of species present in a neighbourhood and their uses, methods of management, conservation status and contributions to local livelihoods. It can investigate local social systems relevant to the management of plants and traditional conservation practices and associated beliefs and rituals.

An ‘applied’ approach to ethnobotany differs from the ‘academic’ mode in its intention to try to make practical progress in conservation as the research proceeds. Apart from any improvements in conservation that may be made, applied ethnobotany has the additional benefit of being very useful for the development of conservation policy, because it provides evidence of what actually works (or does not work) on the ground.

Applied ethnobotany involves the development of partnerships between ethnobotanists (with access to scientific knowledge and methodologies) and local people (with their values, knowledge and practical ways of interacting with plants). Both parties are involved in setting the research questions, undertaking the research, analysing the data, and identifying the implications of the findings for conservation and sustainable development. Problem identification can be an on-going process, for instance with initial assumptions becoming questioned as more information comes to light and new questions arising as the work moves into new phases. Applied ethnobotany undertaken in a participatory and action-orientated way helps to ensure that priority issues from the local perspective are addressed, thus making it more likely that local people will be committed to implementing solutions found (Sheil *et al.*, 2006).

5 Winning more public support for plant conservation

An unintended consequence of the traditional approach to plant conservation may have been to let politicians off the hook. If plant conservation is conceived as being mainly about saving plant species (seen as units virtually disconnected from ecosystems and economies), then politicians may believe that have contributed sufficiently, once they have provided funds to conserve a shortlist of Red-listed species at a few sites in the wild and supported the development of seedbanks. Welcome though such contributions are, the sum total of their influence will only extend to a minute fraction of the total plant cover of the Earth, far below what is needed according to the vision of an ecosystem-based approach.

Taking an ecosystem-based approach to plant conservation and an applied approach to ethnobotany may result in more support being given to fundamental botanical institutions underlying plant conservation (such as herbaria) and attract more students to study botany. There have been many complaints in recent years about a lack of support for herbaria and

for plant taxonomy generally, while whole plant botany has been in decline as a taught subject around the world (Disney, 1998; Hamilton *et al.*, 2003; Noss, 1996; Wilson, 2000). A new generation of field botanists may be stimulated to become applied ethnobotanists, a subject so useful for putting plant conservation into effect.

6 Conclusion

Many details given here may require revision as more experience is gained on how an ecosystem-based approach to plant conservation can best be applied. However, the basic case is believed to be solid: that the world is in deep environmental trouble, that plant conservation should be pursued everywhere and that all plant-related aspects of conservation should be taken into account. Ethnobotany is one of the most valuable tools available for use by the plant conservation community, especially in its applied form in which it draws on knowledge and skills associated with both local communities and scientists to identify and try to find answers to problems of concern. Taking an applied approach to ethnobotany will help overcome the commonly encountered problem of a disconnect between academia and the practical pursuit of conservation (Cowling *et al.*, 2008; Gibbons *et al.*, 2011; Knight *et al.*, 2006; Milliken *et al.*, 2010).

Acknowledgements: The research was financed by grants to Plantlife International from the Allachy Trust, the Rufford Maurice Laing Foundation, the Gurney Charitable Trust, the Tanner Trust and Dr William Hamilton. Patrick Hamilton assisted with literature research.

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